**South Dakota Agricultural Education (AFNR)**

**Academic Integration Activities**

**ACTIVITY #10**

*Natural Resources students will be able to predict outcomes of natural random events based on theoretical probabilities.*

**1. Ag Standard**

Natural Resources, NR1.3: Examine planning data to determine natural resource status.

* Collect data to determine resource availability and health of a specific natural resource.
* Analyze resource inventory and population studies of natural resources.

**2. Academic Standard**

9-12.S.2.2: Students are able to predict outcomes of simple events using given theoretical probabilities (Comprehension).

* Determine the sample space of an experiment.

**3. Background Information**

**Probability**

A probability is the likelyhood or chance of something happening in a given experimen.

The formula for theoretical probability of an event is:

P(event) = number of desired outcomes/number of total outcomes

Forexample, the probability of flipping a heads when flipping a coin is ½. On a coin, there are only 2 possible outcomes, heads or tails. The total possible outcomes, 2, is our denominator. The total number possible for our desired outcome of heads, 1, is our numerator. Thus a probability of ½.

Probabilities can be written as a fraction, ½, a ratio 1:2, a percentage 50%, or a decimal 0.5.

**Sample Space**

The sample space of an experiment is the set of all possible outcomes of the experiment. For example, when flipping a coin, the sample space is: head, tail.

**4. Example in Context**

Assume 1 out of every 6 eggs laid by a hen pheasant will not fully incubate and hatch. While monitoring a hens nest, a student was able to number eggs as they were laid, 1 through 6, 1 being the first laid and 6 being the last. Find the sample space of this experiment. What is the probability that the last egg laid will not hatch?

First, lets figure out the sample space. We have 6 eggs that we are monitoring to see if they hatch or do not hatch. So our sample space is: egg 1, egg 2, egg 3, egg 4, egg 5, egg 6.

Next figure the probability for each egg to not hatch. If only 1 in every 6 eggs does not hatch, and we have a nest of 6 eggs, each egg has a 1 in 6 chance of not hatching. The probability for each set in our sample space would look like this: egg 1: 1/6, egg 2: 1/6, egg 3: 1/6, egg 4: 1/6, egg 5: 1/6, egg 6: 1/6.

*Answer: P(egg 6 not hatching) = 1/6, 1:6, 0.16̅6̅ , or %16.6.*

**5. Guided Practice Exercises**

Assume a student was cruising an acre of wooded land to identify the types of trees in the area. She identified 27 trees: 7 Boxelder, 9 Black Walnut, 5 Green Ash, and 6 Bur Oak. Identify the sample space of this acre of land. If a single tree is randomly hit and killed by lightning in a storm, what is the probability of each type of tree in this surveyed acre being hit?

Sample Space: Boxelder, Black Walnut, Green Ash, Bur Oak

P(Boxelder hit by lightning) = 7/27, 7:27, .2592̅5̅9̅, or %25.9

P(Black Walnut hit by lightning)= 9/27 = 3/9 = 1/3 (be sure to simplify), 1:3, .3̅3̅, or %33.3

P(Green Ash hit by lightning) = 5/27, 5:27, .1851̅8̅5̅, or %18.5

P(Bur Oak hit by lightning) = 6/27 = 2/9, 2:9, .2̅2̅, or %22.2

**6. Independent Practice Exercises**

Assume a student sets up a live trap to survey small game animals in a specific habitat. The trap was set out for 30 days and checked each morning. At the end of 30 days, 16 animals had been trapped: 9 prairie dogs, 3 mink, 2 opossum, and 2 raccoons. Identify the sample space of this experiment. What is the probability if the student set up a trap in that space that the next animal they would catch is a mink?

*Answer:*

*Sample Space: Prairie Dog, Mink, Opossum, Raccoon*

*P(catching mink) = 3/16, 3:16, 0.1875, or %18.75*

Assume a student works for a company that mines uranium. The company drilled 127 test holes on a section of land to help identify commercial grade of uranium deposits prior to beginning mining the section. Of the 127 samples taken from the holes, 98 tested positive for uranium. The other 29 samples turned out negative for uranium. Of the 98 positive samples, only 56 were commercial grade. Identify the sample space for this section of land. What is the probability that any random test site on that section of land contained commercial grade uranium?

*Answer:*

*Sample Space: commercial grade uranium, non-commercial grade uranium, no uranium*

*P(finding commercial grade uranium) =: 56/127, 57:127, .448818897…, or %44.9*

**7. Notes**

A Natural Resources teacher could have students do a simple biodiversity lab where students identify the different types of natural resources (i.e. number of animals, plants, soil type, rock type…) in a given space (like a hula-hoop). Once they collect the data on the different resources and number of each type of resource, they could figure the sample space and probabilities that if one resource was taken from that space at random, what would the probability be for each type of resource to be removed?